



九齊科技股份有限公司
Nyquest Technology Co., Ltd.

DATA SHEET

NY3A Series

1 I/O Single-Chip Speech Synthesizer

Version 1.2

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Revision History

<i>Version</i>	<i>Date</i>	<i>Description</i>	<i>Modified Page</i>
1.0	2007/8/6	Release.	-
1.1	2007/11/27	2.6.b : Modify pull-low resistor description. Change 300k to CDS, and describe CDS function in details.	3, 4
1.2	2008/7/29	7. : Modify DC Characteristics “Voltage vs Frequency” curve, adjust this curve to be flatter.	6

1. 概述

NY3A系列產品為單晶片CMOS語音合成 IC，共有4個母體分別為NY3A003A、NY3A006A、NY3A009A 和 NY3A012A。只有1個Input腳，利用精準的內阻震盪故不需外加震盪電阻，只有一組PWM輸出，故無須再外加任何零件。語音合成方式為 4-bit LOG-PCM，藉由製造過程中更換Code光罩，可將不同的語音資料寫入ROM中。用戶可使用簡便的 Q-Speech 工具軟體來快速地進行開發。

2. 功能

(1). 寬廣的工作電壓：1.6V ~ 6.0V。

(2). 共有4個母體，ROM大小及秒數(@6kHz)如下：

NY3A003	NY3A006	NY3A009	NY3A012
4880H	9100H	D980H	12200H
3.09s	6.19s	9.28s	12.37s

(3). 語音最多可被分割成32個語音段(Voice Section)，每段長度可不同。每一個語音段的長度(語音+ 靜音時間)最多可達 10 秒 (在6kHz取樣頻率下)。每一語音段中的語音+靜音長度必須為 04H (Hex) 的整數倍。

(4). 共有256個語音格(Voice Step)，可規劃成16個語音組(Voice Sentence)，每個語音組(Sentence)可放的語音格(Step)並沒有限制(但最多只有256個語音格)。每一語音格(Step)可指定一語音段(Section)。

(5). 只有內建一組準確的頻率振盪器(+/- 6% 誤差)，並無提供外部震盪電阻選項。共有14種不同播放速度的選擇，但只可選擇其中一種播放速度。

1	2	3	4	5	6	7
10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz	6.5kHz	6.0kHz
8	9	10	11	12	13	14
5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

(6). 只有一個 OKY 輸入腳，輸入選項：(光罩選擇)

(a). 可選擇 Edge/Level, Hold/Unhold, Retrigger/Irretrigger 不同的觸發方式組合。

(b). 可選擇 CDS+1M、CDS、1M 的下拉電阻 或 Floating。(CDS+1M選項: 當按鍵按下時，IC內部為 1M 的下拉電阻；而當按鍵放開時，IC內部為 300K+1M 並聯 的下拉電阻 約230K。CDS: 當按鍵按下時，IC內部為 Floating；而當按鍵放開時，IC內部為 300K 的下拉電阻。)

(c). 可選擇不同的防止誤動作(Debounce)時間：Long - 提供一般手動操作；Short - 提供彈跳開關使用。

(d). 最多有16個 Sentence 的 One-Key sequential 或 random 的選擇。

(7). 一組PWM輸出，可直接驅動喇叭或蜂鳴片。

1. GENERAL DESCRIPTION

The NY3A series are single-chip voice synthesizing CMOS IC. There are 4 bodies: NY3A003A, NY3A006A, NY3A009A and NY3A012A. Each body has one input pin. Through accurate internal oscillation, external R_{osc} is unnecessary. There is only one PWM output for voice. Thus any external component is not required. Using 4-bit LOG-PCM algorithm, customer's speech data can be programmed into ROM by changing one code mask during fabrication. Besides, an interactive software developing tool "Q-Speech" is user-friendly and quick for programming.

2. FEATURES

(1). Wide operating voltage: 1.6V ~ 6.0V.

(2). There are 4 bodies. ROM size and speech duration @ 6kHz are as following.

NY3A003	NY3A006	NY3A009	NY3A012
4880H	9100H	D980H	12200H
3.09s	6.19s	9.28s	12.37s

(3). The total voice duration can be partitioned up to 32 *Voice Sections*. Each *Voice Section* length is flexible. Each voice length (voice+mute) can be individually up to 10 seconds at 6kHz S.R.. The *Voice Section* length of "voice length + mute length" must be the multiple of 04H (Hex).

(4). Total 256 *Voice Steps* are available for 16 *Voice Sentences*. Each *Sentence* can only use maximum 256 *Steps*. For each *Step*, it can specify one *Voice Section*.

(5). Only build in an accurate internal oscillator of +/- 6% tolerance, no external R_{osc} oscillator. There are 14 kinds of options for play speed, but user can only select one of them to use.

1	2	3	4	5	6	7
10.0kHz	9.0kHz	8.2kHz	7.5kHz	7.0kHz	6.5kHz	6.0kHz
8	9	10	11	12	13	14
5.6kHz	5.3kHz	5.0kHz	4.7kHz	4.5kHz	4.3kHz	4.1kHz

(6). There is only one OKY input pin. Input option: (Mask option)

(a). OKY input can select Edge/Level, Hold/Unhold and Retrigger/Irritrigger trigger modes.

(b). OKY input can select CDS+1M, CDS, 1M pull-low resistor or Floating type.

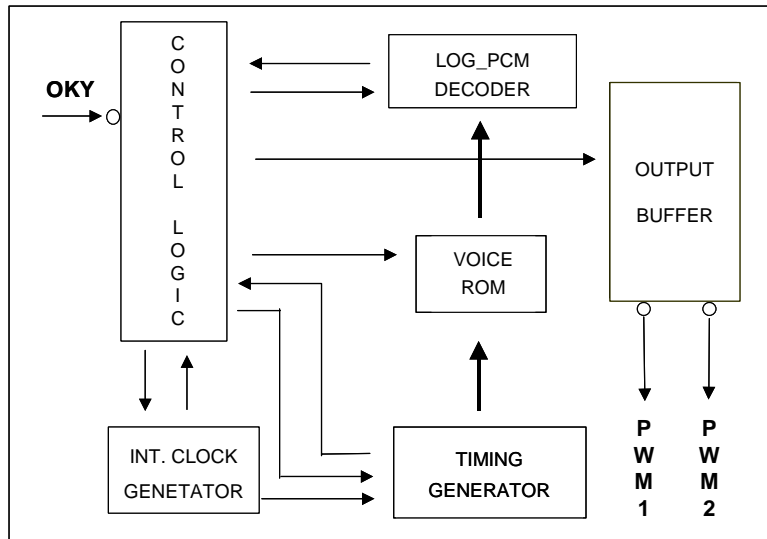
(CDS+1M option: Only 1M pull-low resistance at key-pressed, and 1M+300K in parallel pull-low resistance around 230K at key-released. CDS option: Floating at key-pressed, and 300K pull-low resistance at key-released.)

(c). OKY input can select Debounce time: Long debounce for push-button. Short debounce for fast switch.

(d). OKY input can select One-Key Sequential or Random for maximum 16 Sentences.

(7). One PWM output can directly drive speaker or buzzer.

3. BLOCK DIAGRAM



4. PAD DESCRIPTION

Pad Name	Pad No.	ATTR.	Description
OKY	1	I	Input pin, active high.
GND	2	Power	Negative power.
VDD	3	Power	Positive power.
PWM1	4	O	PWM output 1.
PWM2	5	O	PWM output 2.

5. DEVELOPMENT & DEMONSTRATION

User can use “Q-Speech” software tool to develop the desired functions. After finishing the code programming, user will get 2 files of “.bin” and “.htm”, the binary file and function check list. Through “FDB_Writer” operation, user can download the “.bin” file into NY3_FDB-02 flash demo board to demonstrate the NY3A function. Once the function has been approved, user only need to send the “.bin” file to Nyquest for code release. For more details, please refer to “Q-Speech” user manual.

2Mb Flash Demo board	NY3_FDB-02
Max. demo body	NY3A011A

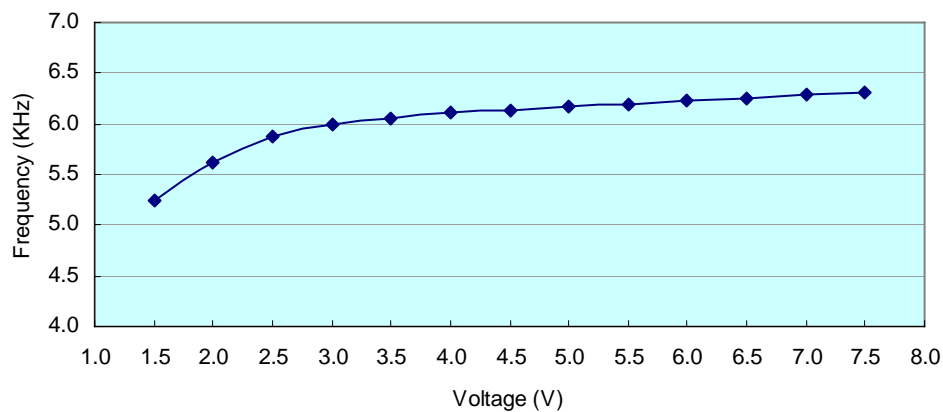
6. ABSOLUTE MAXIMUM RATING

Symbol	Rating	Unit
VDD~GND	-0.5 ~ +7.5	V
Vin	$GND-0.3 < V_{in} < VDD+0.3$	V
Vout	$GND < V_{out} < VDD$	V
Top (operating)	-0 ~ +70	°C
Tst (storage)	-55 ~ +150	°C

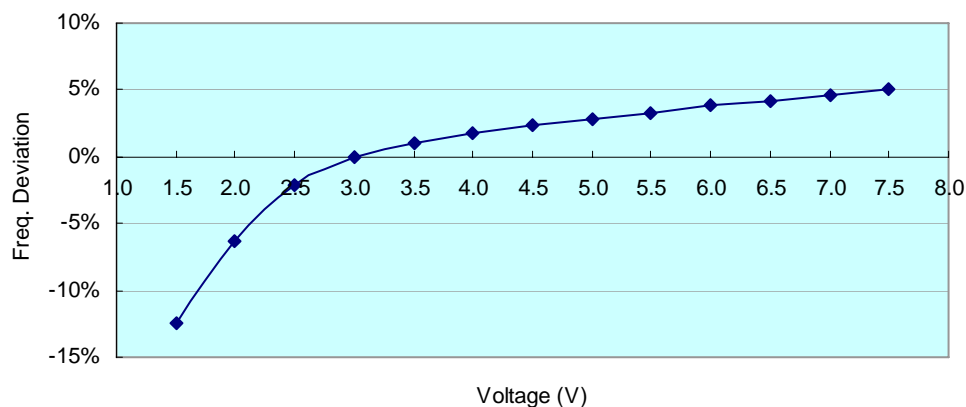
7. DC CHARACTERISTICS

Symbol	Parameter		Min.	Typ.	Max.	Unit	Condition
VDD	Operating voltage		1.6	3.0	6.0	V	
I _{sb}	Standby current, VDD=3V/4.5V				1	uA	No loading, 6kHz S.R.
I _{op}	Operating current	VDD=3V		200			
		VDD=4.5V		500			
I _{ih}	Input current: OKY (1M pull-low)				3	uA	VDD=3V
					8		VDD=4.5V
I _{ih}	Input current: OKY (300k pull-low)				10	uA	VDD=3V
					25		VDD=4.5V
I _{oh}	PWM1, PWM2 output current			-60		mA	VDD=3V, V _{oh} =1.5V
I _{ol}				60			VDD=3V, V _{ol} =1.5V
$\Delta F/F$	Frequency deviation by voltage drop (6kHz)	VDD=3V		4		%	$\frac{F_{osc}(3.0v)-F_{osc}(2.4v)}{F_{osc}(3v)}$
		VDD=4.5V		3			$\frac{F_{osc}(4.5v)-F_{osc}(3.0v)}{F_{osc}(4.5v)}$
$\Delta F/F$	Frequency lot deviation, VDD=3V (6kHz)		-6		6	%	$\frac{F_{max}(3.0v)-F_{min}(3.0v)}{F_{max}(3.0v)}$

Voltage vs Frequency (6.0KHz @3V)



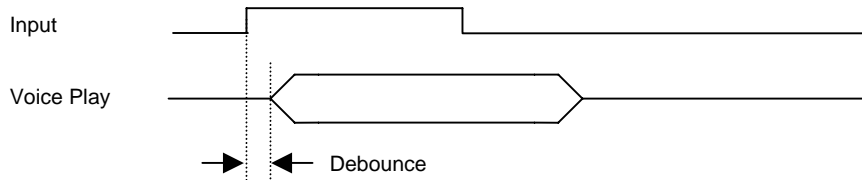
Voltage vs Freq. Deviation (6.0KHz @3V)



8. TIMING DIAGRAM

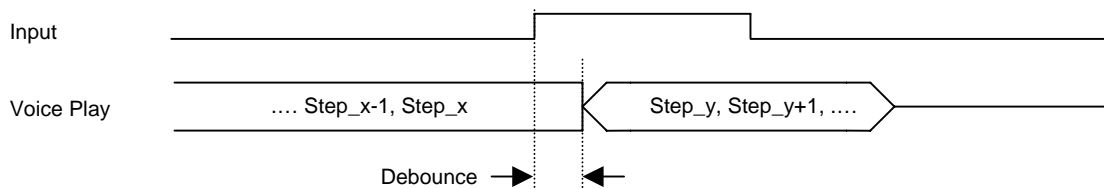
(1) Debounce Time

(a). Trigger while no playing voice



※ Debounce time is configured by 6 kHz S.R and the value is fixed. That is, Long debounce = 20ms, Short debounce = 50us

(b). Trigger While playing voice

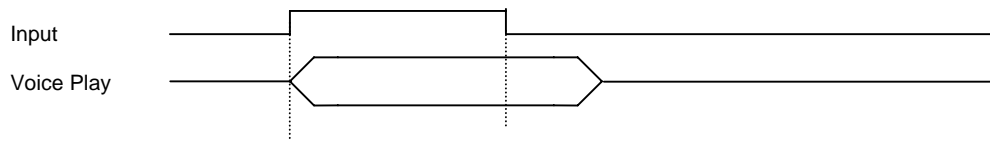


※ Debounce Time is configured by the S.R. of Step_x. At S.R. = 6kHz, Long debounce = 20ms, Short debounce = 50us

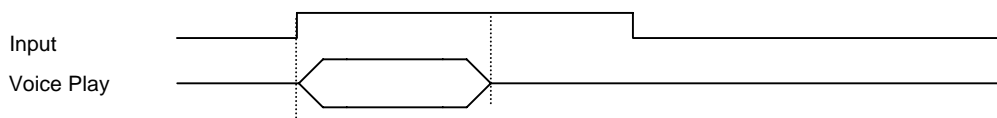
For example, if Step_x S.R. = 8kHz, Long debounce = $20\text{ms} \times (6\text{k}/8\text{k}) = 15\text{ms}$, Short debounce = $50\text{us} \times (6\text{k}/8\text{k}) = 37.5\text{us}$

(2) Basic Operation

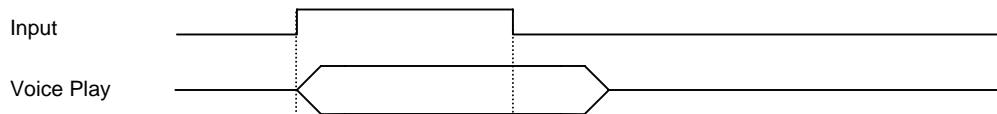
(a). Edge mode, Edge trigger



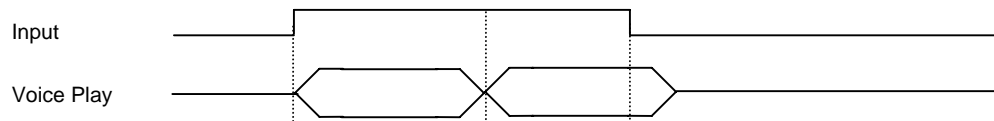
(b). Edge mode, Level trigger

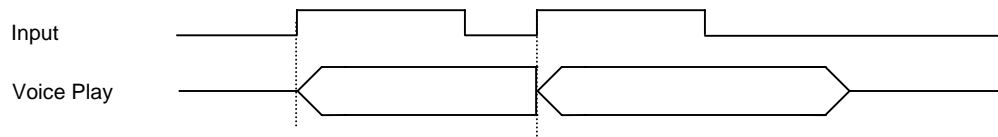
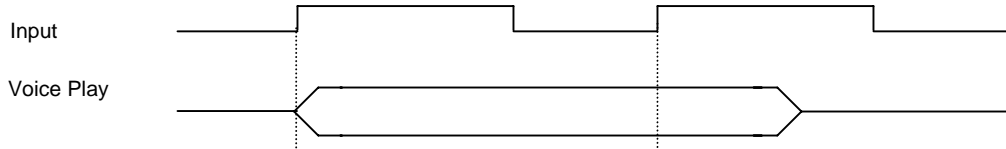


(c). Level mode, Edge trigger



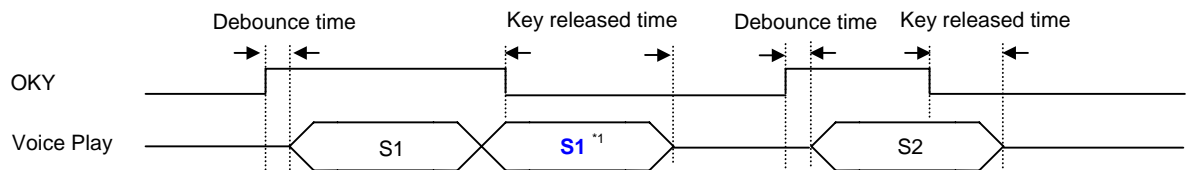
(d). Level mode, Level trigger



(e). Retrigger mode

(f). Irretrigger mode

(3) Advanced Operation
(a). Sequential Function

OKY (L/U/I) =S1 S2 S3 S4

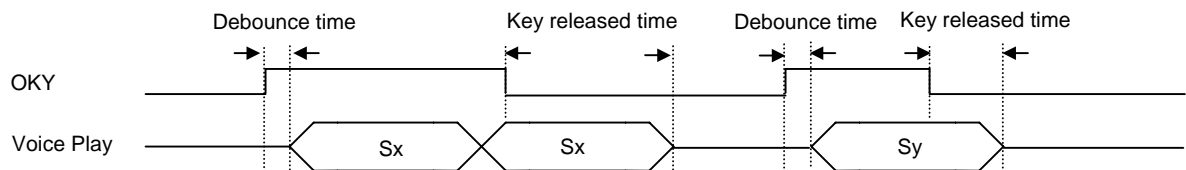
Sequential (or Random) number is counted during “debounce time” or “key released time”. But the first-time trigger only relies on “debounce time” due to no “key release time”.



*1: In OKY mode, Sequential number is counted only if there is debounce happened.

(b). Random Function

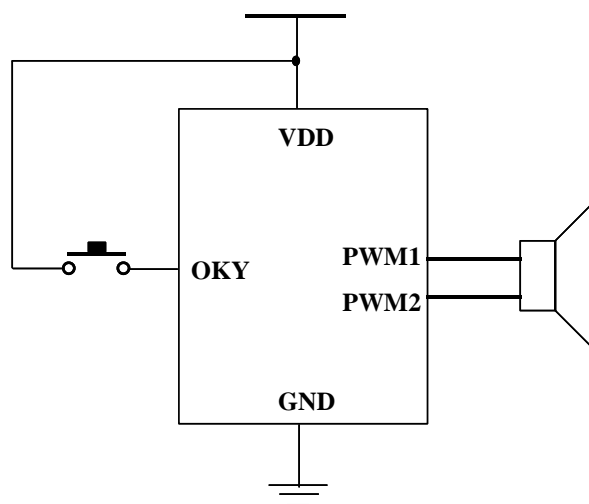
OKY (L/U/I) =S1 S2 S3 S4



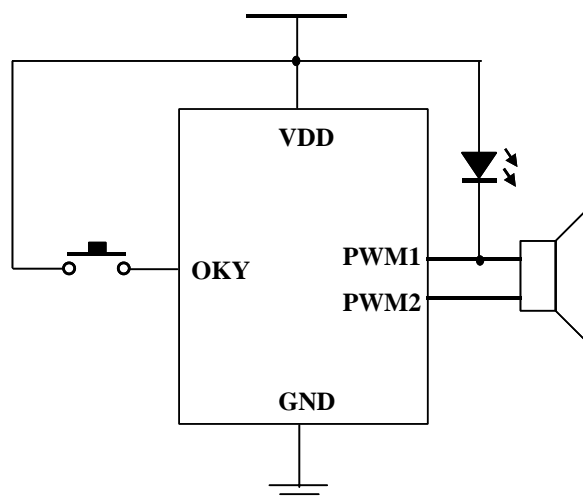
x=1, 2, 3 or 4; y=1, 2, 3 or 4 (x and y are random number)

9. APPLICATION

(1) 1 trigger



(2) 1 trigger with 1 LED



10. BONDING DIAGRAM

